

invention. Stimulation device 110 is capable of treating both fast and slow arrhythmias with stimulation therapy, including cardioversion, defibrillation, and pacing stimulation. While a particular multi-chamber device is shown, this is for illustration purposes only, and one of skill in the art could readily duplicate, eliminate or disable the appropriate circuitry in any desired combination to provide a device capable of treating the appropriate chamber(s) with cardioversion, defibrillation and pacing stimulation. Additional details of stimulation device 110 are disclosed in co-pending, commonly assigned application No. (Attorney Docket No. VT0304), filed <sup>09/861230</sup> 5/17/01 in the name of Mark W. Kroll, titled "METHODS AND DEVICES FOR RAPID DELIVERY OF SECONDARY CARDIAC SHOCKS," the disclosure of which is incorporated herein by reference.

- [0030] As further shown in FIG. 3, microcontroller 214 typically includes a microprocessor, or equivalent control circuitry, designed specifically for controlling the delivery of stimulation therapy. The details of the design of microcontroller 214 are not critical to the present invention. The use of microprocessor-based control circuits for performing timing and data analysis functions is well known in the art.
- [0031] Microcontroller 214 includes timing control circuitry 312 which is used to control pacing parameters. Microcontroller 214 classifies the timing intervals by comparing them to predefined limits and various other characteristics (e.g., physiologic sensors 306, morphology detector 314, etc.) in order to determine the type of remedial therapy that is needed (e.g., pacing, defibrillation shocks). A sensing system of the present invention, for example, is implemented in the arrhythmia detection software and/or hardware 310 of microcontroller 214. Each sensing circuit 318 and 320 in device 110, preferably employs one or more low power, precision amplifiers with programmable gain and/or automatic gain control, bandpass filtering, and a threshold detection circuit, as known in the art, to selectively sense the cardiac signal of interest.
- [0032] As further shown in FIG. 3, microcontroller 214 controls pulse generators 316 and 322 via appropriate control signals to trigger or inhibit